

1 **In the Claims:**

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3 1. **(Currently Amended)** A processor-readable medium comprising
4 processor-executable instructions for mapping color data, the processor-executable
5 instructions comprising instructions for:

6 adjusting a degree to which BG color coefficient generation is similar for
7 process-neutral and K-only neutral images to produce BG coefficients;

8 adjusting a degree to which UCR color coefficient generation is similar for
9 process-neutral and K-only neutral images to produce UCR coefficients; and

10 mapping CMY color data to CMYK color data using the produced BG
11 coefficients and the produced UCR coefficients, wherein the mapping includes
12 instructions for:

13 moving points in a process-neutral color space, thereby mapping the
14 CMYK data to reduce color in neutral colors in process-neutral images, wherein
15 moving points in a process-neutral color space includes instructions for:

16 mapping the process-neutral color space into a color space
17 defined in Lab:

18 establishing a first vector between a point on a neutral axis
19 and a point having a neutral hue;

20 establishing a second vector through the point on the neutral
21 axis and a point to be moved and a point on a boundary of the color space defined
22 in Lab;

23 establishing a third vector through the point having neutral
24 hue and the point on the boundary of the color space defined in Lab;

1 establishing a fourth vector bisecting the second and the third
2 vectors;

3 projecting the point to be moved onto the fourth vector; and
4 using formulas based on lengths of the vectors to move the
5 point to be moved to a new location in the color space defined in Lab having
6 similar L value.

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8 **2. (Original)** The processor-readable medium as recited in claim 1,
9 wherein adjusting the degree to which BG color coefficient generation is similar
10 includes instructions for:

11 using similar BG coefficients for a color in both process-neutral and K-only
12 images, wherein the color is greater than a distance from a neutral line;

13 using dissimilar BG coefficients for a color in both process-neutral and K-
14 only images, wherein the color is less than the distance from the neutral line; and
15 controlling the distance.

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17 **3. (Original)** The processor-readable medium as recited in claim 2,
18 wherein controlling the distance includes instructions for:

19 setting the distance based on whether the process-neutral and K-only
20 neutral images will be printed side-by-side.

1 **4.** (**Original**) The processor-readable medium as recited in claim 1,
2 wherein adjusting the degree to which UCR color coefficient generation is similar
3 includes instructions for:

4 using similar UCR coefficients for a color in both process-neutral and K-
5 only images, wherein the color is greater than a distance from a neutral line; and

6 using dissimilar UCR coefficients for a color in both process-neutral and K-
7 only images, wherein the color is less than the distance from the neutral line.

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9 **5.** (**Original**) The processor-readable medium as recited in claim 1,
10 wherein adjusting the degree to which UCR color coefficient generation is similar
11 includes instructions for:

12 assigning a greater value to UCR coefficients of a minor color; and

13 assigning a lesser value to UCR coefficients of more dominate colors.

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15 **6.** (**Cancelled**)

16 **7.** (**Cancelled**)

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18 **8.** (**Currently Amended**) The processor-readable medium as recited in
19 claim 7 claim 1, wherein using formulas includes instructions for:

20 mapping values of a and b by adding $(dps/(db - \text{constant} * vml)) * vm(1)$
21 and $(dps/(db - \text{constant} * vml)) * vm(2)$ respectively; and

22 mapping values of a and b by adding values a and b to the vector vm where
23 the point to be moved is within a circle enclosing the first vector.

1 **9. (Currently Amended)** A method of controlling a degree to which a
2 process-neutral image and a K-only neutral image are harmonized, comprising:

3 generating similar BG values for colors within the process-neutral image
4 and the K-only neutral image beyond a first distance from a first neutral axis;

5 generating dissimilar BG values for colors within the process-neutral image
6 and the K-only neutral image within the first distance from the first neutral axis;

7 generating similar UCR values for colors within the process-neutral image
8 and the K-only neutral image beyond a second distance from a second neutral
9 axis;

10 generating dissimilar UCR values for colors within the process-neutral
11 image and the K-only neutral image within the second distance from the second
12 neutral axis; and

13 mapping CMY color data to CMYK color data using the generated BG
14 coefficients and the generated UCR coefficients, wherein the mapping includes:

15 adjusting the first and second distances to balance color similarity between
16 the process-neutral image and the K-only neutral image against a smooth
17 transition from colors to neutral within the K-only neutral image.

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19 **10. (Cancelled)**

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1 **11. (Original)** The method of claim 9, wherein the mapping includes:

2 reducing color within a region adjacent to a neutral axis of a process-neutral
3 color space by mapping the process-neutral color space into an Lab color space
4 and moving a point within the Lab color space according to vectors connecting the
5 point within the Lab color space, a point on a neutral axis in the Lab color space, a
6 point on a boundary of the Lab color space and a point having neutral hue.

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8 **12. (Original)** The method of claim 9, wherein the mapping includes:

9 mapping colors into a color space defined in Lab; and
10 mapping each point within the color space defined in Lab, wherein points
11 along a process-neutral axis are mapped to more neutral colors.

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13 **13. (Original)** The method of claim 12, wherein mapping each point
14 includes:

15 establishing a first vector between a point on a neutral axis and a point
16 having neutral hue;

17 establishing a second vector through the point on the neutral axis and a
18 point to be moved and a point on a boundary of the color space;

19 establishing a third vector through the point having neutral hue and the
20 point on the boundary of the color space;

21 establishing a fourth vector bisecting the second and the third vectors;

22 projecting the point to be moved onto the fourth vector; and

23 using formulas based on lengths of the vectors to move the point to be
24 moved to a new location having a similar L value.

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2 **14. (Original)** The method of claim 13, wherein using formulas
3 includes:

4 applying a first formula wherein a point to be moved is within a circle
5 enclosing the first vector; and

6 applying a second formula wherein the point to be moved is not within the
7 circle enclosing the first vector.

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1 **15. (Currently Amended)** A color mapping apparatus, comprising:

2 a BG module to generate BG coefficients for process-neutral and K-only
3 images, and to adjust a degree to which the generation of BG coefficients is
4 similar for the process-neutral and the K-only images;

5 a UCR module to generate UCR coefficients for process-neutral and K-only
6 images, and to adjust a degree to which the generation of UCR coefficients is
7 similar for the process-neutral and the K-only images; and

8 a mapping module to map CMK color data to CMYK color data using the
9 generated BG coefficients and the generated UCR ~~coefficients~~; and

10 a neutral axis correction module to reduce color from a neutral axis of a
11 process-neutral color space by moving points in the process-neutral color space to
12 make the neutral axis less colorful, wherein the neutral axis correction module
13 comprises configurations for:

14 mapping the process-neutral color space into Lab color space;

15 establishing a first vector between a point on the neutral axis and a
16 point having neutral hue;

17 establishing a second vector through the point on the neutral axis and
18 a point to be moved and a point on a boundary of the gamut;

19 establishing a third vector through the point having neutral hue and
20 the point on the boundary of the gamut;

21 establishing a fourth vector bisecting the second and third vectors;

22 projecting the point to be moved onto the fourth; and

23 using formulas based on the vectors to move the point to be moved
24 to a new location having similar L value with less color.

1 **16. (Original)** The color mapping apparatus of claim 15, where
2 in the BG module comprises configurations for:

3 using similar BG coefficients to map a color in both process-neutral and K-
4 only mapping, wherein the color is greater than a distance from a neutral line;

5 using dissimilar BG coefficients to map a color in both process-neutral and
6 K-only mapping, wherein the color is less than the distance from the neutral line;
7 and

8 controlling the distance to achieve a desired degree of harmony between the
9 process-neutral and K-only images.

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11 **17. (Original)** The color mapping apparatus of claim 15, where in the
12 UCR module comprises configurations for:

13 using similar UCR coefficients to map a color in both process-neutral and
14 K-only mapping, wherein the color is greater than a distance from a neutral line;

15 using dissimilar UCR coefficients to map a color in both process-neutral
16 and K-only mapping, wherein the color is less than the distance from the neutral
17 line; and

18 controlling the distance to achieve a desired degree of harmony between the
19 process-neutral and K-only images.

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21 **18—19. (Cancelled)**

1 **20. (Currently Amended)** The color mapping apparatus of claim
2 49, wherein the neutral axis correction module additionally comprises
3 configurations for:

4 mapping values of a and b by adding $(dps/(db - \text{constant} * vml)) * vm(1)$
5 and $(dps/(db - \text{constant} * vml)) * vm(2)$ respectively; and

6 mapping values of a and b by adding them to the vector vm where the point
7 to be moved is within a circle enclosing the correction vector.

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9 **21—26. (Cancelled)**

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11 **27. (Currently Amended)** A processor-readable medium comprising
12 processor-executable instructions for controlling a degree to which a process-
13 neutral image and a K-only neutral image are harmonized, the processor-
14 executable instructions comprising instructions for:

15 generating similar BG values for colors within the process-neutral image
16 and the K-only neutral image beyond a distance from a neutral axis;

17 generating dissimilar BG values for colors within the process-neutral image
18 and the K-only neutral image within the distance from the neutral axis; and

19 mapping CMY color data to CMYK color data using the generated BG
20 coefficients; and

21 adjusting the distance to balance color similarity between the process-
22 neutral image and the K-only neutral image against a smooth transition to the
23 neutral axis in colors within the K-only neutral image.

1 **28. (Cancelled)**

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3 **29. (Original)** The processor-readable medium as recited in claim 27,
4 wherein the mapping includes instructions for:

5 reducing color within a region adjacent to the neutral axis by moving most
6 or all points in a process-neutral color space within which the process-neutral axis
7 is defined.

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9 **30. (Original)** The processor-readable medium as recited in claim 27,
10 wherein the mapping includes instructions for:

11 reducing color within a region adjacent to the neutral axis within a process-
12 neutral color space by mapping process-neutral colors into an Lab color space and
13 moving a point within the Lab color space according to vectors connecting the
14 point within the Lab color space, a point on the neutral axis, a point on a gamut
15 boundary and a point having neutral hue.

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1 **31.** (**New**) A method of controlling a degree to which a process-neutral
2 image and a K-only neutral image are harmonized, comprising:

3 generating similar BG values for colors within the process-neutral image
4 and the K-only neutral image beyond a first distance from a first neutral axis;

5 generating dissimilar BG values for colors within the process-neutral image
6 and the K-only neutral image within the first distance from the first neutral axis;

7 generating similar UCR values for colors within the process-neutral image
8 and the K-only neutral image beyond a second distance from a second neutral
9 axis;

10 generating dissimilar UCR values for colors within the process-neutral
11 image and the K-only neutral image within the second distance from the second
12 neutral axis; and

13 mapping CMY color data to CMYK color data using the generated BG
14 coefficients and the generated UCR coefficients, wherein the mapping includes
15 reducing color within a region adjacent to a neutral axis of a process-neutral color
16 space by mapping the process-neutral color space into an Lab color space and
17 moving a point within the Lab color space according to vectors connecting the
18 point within the Lab color space, a point on a neutral axis in the Lab color space, a
19 point on a boundary of the Lab color space and a point having neutral hue.

1 **32. (New)** A processor-readable medium comprising processor-
2 executable instructions for controlling a degree to which a process-neutral image
3 and a K-only neutral image are harmonized, the processor-executable instructions
4 comprising instructions for:

5 generating similar BG values for colors within the process-neutral image
6 and the K-only neutral image beyond a distance from a neutral axis;

7 generating dissimilar BG values for colors within the process-neutral image
8 and the K-only neutral image within the distance from the neutral axis; and

9 mapping CMY color data to CMYK color data using the generated BG
10 coefficients, wherein the mapping includes instructions for:

11 reducing color within a region adjacent to the neutral axis within a
12 process-neutral color space by mapping process-neutral colors into an Lab color
13 space and moving a point within the Lab color space according to vectors
14 connecting the point within the Lab color space, a point on the neutral axis, a point
15 on a gamut boundary and a point having neutral hue.

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17 **33. (New)** A method of controlling a degree to which a process-neutral
18 image and a K-only neutral image are harmonized, comprising:

19 generating similar BG values for colors within the process-neutral image
20 and the K-only neutral image beyond a first distance from a first neutral axis;

21 generating dissimilar BG values for colors within the process-neutral image
22 and the K-only neutral image within the first distance from the first neutral axis;

1 generating similar UCR values for colors within the process-neutral image
2 and the K-only neutral image beyond a second distance from a second neutral
3 axis;

4 generating dissimilar UCR values for colors within the process-neutral
5 image and the K-only neutral image within the second distance from the second
6 neutral axis; and

7 mapping CMY color data to CMYK color data using the generated BG
8 coefficients and the generated UCR coefficients, wherein the mapping includes:

9 mapping colors into a color space defined in Lab; and

10 mapping each point within the color space defined in Lab, wherein
11 points along a process-neutral axis are mapped to more neutral colors, wherein
12 mapping each point includes:

13 establishing a first vector between a point on a neutral axis
14 and a point having neutral hue;

15 establishing a second vector through the point on the neutral
16 axis and a point to be moved and a point on a boundary of the color space;

17 establishing a third vector through the point having neutral
18 hue and the point on the boundary of the color space;

19 establishing a fourth vector bisecting the second and the third
20 vectors;

21 projecting the point to be moved onto the fourth vector; and

22 using formulas based on lengths of the vectors to move the
23 point to be moved to a new location having a similar L value.